

Observatory, was able to make successful exposures for the corona with a small telescope. It was reported clear during the whole eclipse at Choshi, a point on the eastern coast near the southern limit of total obscuration, but there were no observers or instruments there for scientific work. It was reported cloudy throughout the whole eclipse at Niigata; while a party of observers who had ambitiously climbed to the top of Nantaisan brought down a record of nothing but clouds and fog. On the whole, Japan appears to have been an uncanny spot to lead an eclipse-track across.

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s.s. *Port Victor*, September 20.

### THE MÄRJALEN SEE.

**L**AKELETS, in which the ice-craggs of a glacier are mirrored, in which miniature bergs may be seen to float, are of occasional, though of rare, occurrence in the Alps—as for example the Lac de Ste. Marguerite, at the foot of the Ruitor glacier; but the Märjalen See, so far as I know, is unique of its kind. It is not formed at the foot of a glacier, either by partial occupation of a shallow basin worn by the ice-stream in its days of greater strength, or by the pounding back of the glacier torrent by an old terminal moraine; but it is on one side of a glacier, which makes a dam across an upland glen. This barrier at times yields to the pressure of the accumulated water sufficiently to allow of its escape beneath the great ice-stream, and it is a recent incident of the kind, noticed in the *Times* of September 30, which has suggested the present article.

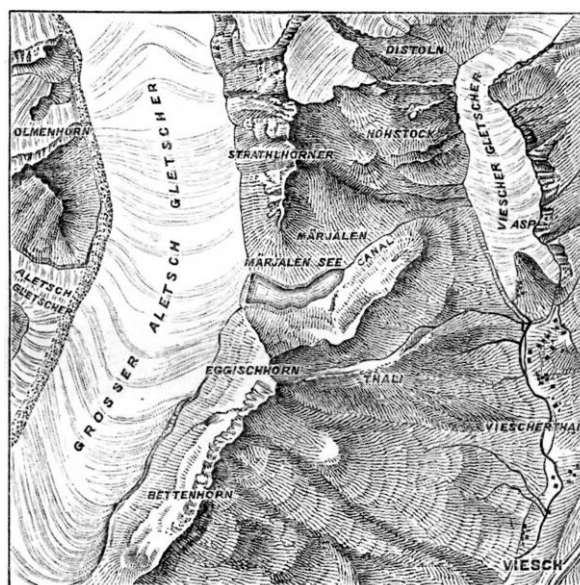
The Great Aletsch glacier, as is well known, is the largest ice-stream not only in the Oberland group, but also in the Alpine chain. Its upper basin is fed by the snows of an almost complete ring of grand peaks, the most conspicuous of which, enumerated from west to east, are the Aletschhorn, the Jungfrau, the Mönch, and the Viescherhörner. All these are considerably above 13,000 feet, and there are several others, less familiar to the ordinary tourist, which either rise slightly above that elevation, or are only a very few hundred feet below it. The great *eismeer* thus formed passes out as a single stream through a "gate in the hills," between the crags of the Faulberg on the east and the base of the Dreieckhorn on the west. This gap is rather more than a mile across, and the glacier for several miles is not less, and is generally rather more, than its breadth at this place. It flows at first slightly to the east of south, then runs almost due south, and finally sweeps gradually round to the south-west. This deflexion is caused by the Eggischhorn, which rises like a great pyramid full in face of the upper course of the glacier to a height of 9649 feet above the sea, or nearly 2000 feet above the surface of the ice. At this spot the Märjalen See is situated, at a height of 7710 feet above the sea, rather less than five miles below the "gate," and rather more than that distance above the end of the Aletsch glacier. This sweeps on along the west flank of the Eggischhorn, until it terminates in the grand gorge of the Massa, at no great distance from the Bel Alp Hotel, a worthy rival in beauty of situation to that on the Eggischhorn.

The Märjalen See is thus formed: the range of the Eggischhorn is continuous with that which makes the left bank of the Aletsch glacier, and divides its comparatively unbroken surface from the narrower and more shattered mass of the Viesch glacier. But this range to the north of the Eggischhorn is deeply notched, so that it is possible to quit the Aletsch glacier and without ascending to reach a depression, barely so high as the surface of the ice, from which one looks down a steep slope on to the surface of the Viesch glacier. From this depression a shallow valley descends towards the west, and is barred, as mentioned above, by the great glacier of the Aletsch

Thus a lake is formed, fed by various streamlets from the slopes on either side and by the melting of the glacier ice. Though now the shrunken stream of the Aletsch glacier does not diverge towards the lake, it was no doubt formerly divided by the opposing mass of the Eggischhorn; then one of its arms occupied the bed of the lake, and after passing over the depression joined itself to the Viesch glacier. Some geologists regard the basin of the Märjalen See as wholly due to the excavatory action of this offshoot of the Aletsch. To myself it appears to be the upper part of a valley, produced in the ordinary way, but subsequently modified in its outlines by the rasping action of the glacier.

At somewhat irregular intervals, but according to popular belief once in seven years, the ice-dam yields sufficiently to allow the pent-up waters to escape beneath the glacier, when the contents of the lake are discharged rapidly down the gorge of the Massa, and, after devastating the fields below, are poured into the Rhone, near Brieg.

In the summer of 1858 I had the good fortune to see the Märjalen See both full and empty. On my first visit I found a lake full 300 yards across at the lower end, and



about three times as long. From the rocky margin on either side the ice arched up in a low flattened curve until its edge at the highest point was about 60 feet<sup>1</sup> above the level of the water. From this it rose in a vertical cliff of almost unbroken ice, of purest white, which was mirrored in the still blue water below. Here and there miniature icebergs were floating, in colour if possible yet purer than the parent glacier, and above the water at the foot of the cliff was a band of turquoise blue. This was produced by the fresh surface of the ice, for the cliff is under-cut by the action of the water of the lake, and to this under-cutting the bergs are no doubt partly due.

Next evening I revisited the spot. To my surprise all was changed: the lake had almost wholly disappeared; the glacier cliff which the day before had been doubled by reflexion, was now doubled in reality. Below the upper zone of white ice was now a zone of more than

<sup>1</sup> Probably the height at the present time is not so great. Since 1858 there has been a considerable shrinking in the glaciers of the Alps. When I visited the Märjalen See in 1881, the greatest height of the cliff did not appear to me to exceed 30 feet. In 1858 Prof. Ramsay found by measurement that the greatest height of the cliff above water was 60 feet, and the greatest depth of the lake at its foot 97 feet ("Peaks, Passes, and Glaciers," 1st series, p. 461).

equal thickness of the most exquisite blue; on the dry bed of the lake were stranded the bergs which the day before had floated in its waters, and we could now appreciate their true size. One whose shape we had greatly admired now appeared even more beautiful with its fantastic pinnacles and blue recesses. It was, I estimated, from 30 to 40 feet high, nearly as wide, and considerably longer. Two cubical masses on the opposite shore were in colour the most lovely turquoise blue that I have ever seen. These, no doubt, on the previous day had appeared as mere slabs on the surface. The bed of the lake was covered with a fine mud, on which were numerous tracks or castings, which I attributed to a worm. I did not see any shells, so that probably no mollusks live in the chilly waters of the Märjalen See.<sup>1</sup>

The ice in this part of the Aletsch glacier is comparatively little crevassed. This permits the glacier to act as a dam; the drainage of the lake is no doubt due to some accidental rupture which opens a communication, quickly enlarged by the running water, with the sub-glacial drainage of the glacier.

A traveller in August 1872 was so fortunate as to see the actual escape of the water at the lower part of the glacier. He describes it as follows<sup>2</sup>:—"It was 4.50 p.m. when we arrived (at the Bel Alp Hotel). The domestics drew our attention to a sound like the roar of a cataract, which seemed to descend the Aletsch. For a time the sound was sub-glacial, but a yellow torrent at length appeared on the opposite side of the glacier, smoking and roaring as it tumbled down the declivities of ice. The front of the torrent soon appeared opposite to the Bel Alp, carrying every movable thing along with it. Wishing to get near the torrent, I descended rapidly to the glacier, crossed it, and succeeded in getting quite close to the rushing water. Everywhere impetuous, it was divided into spaces of tolerably uniform slope, separated from each other by steep and broken declivities, down which the water plunged with tremendous fury. At the base of one of these falls it was met by a kind of reflecting surface, by which the rhythmic character of the motion was finely revealed. The water here was tossed upwards in a series of vast parallel fans, carrying with them ice-blocks and stones, and breaking above into a spray as fine as smoke. A bend of the glacier came in for the lateral portion of this spray, and over it the rounded blocks of ice and the stones were showered like projectiles. The sound of the torrent had not abated at bed-time, but this morning all is quiet, and no water is to be seen in the temporary channel."

This sudden discharge of so great a body of water, in addition to damaging the fields immediately below, very considerably raises the level of the Rhone. On the last occasion, September 4, the writer quoted at the beginning of this article states that "the level of the Rhone rose at Brieg 5½ feet, from about 3½ feet to 9 feet, and at Sitten 4 feet, from 6½ feet to 10½ feet. The greatest rise observed since the regulation of the Rhone from the same cause took place on July 19, 1878, and although it was then at Brieg only 5 feet, and at Sitten only 3 feet, it was considered a very fortunate circumstance that the event took place at a very low level of the Rhone for the season."<sup>3</sup> He adds that to avoid such a danger in future it is proposed to enlarge greatly a channel which many years since was cut through the moraine stuff overlying the rock east of the lake, and so provide an outlet towards the Viesch glacier. By this "the volume of its waters will be reduced to about half what it is at present (10,000,000

cubic metres)." So that future travellers will not see the Märjalen See in its full beauty. The lake formed by the advance of the Gétroz glacier, in the upper part of the Dranse valley, the bursting of which in 1818 wrought such fearful devastation, may be regarded as to some extent a parallel case with the Märjalen See, of a more temporary nature, but on a grander scale.

In Sir Charles Lyell's "Principles of Geology" (chapter xvi.), and again in his "Antiquity of Man" (chapter xiv.), are notices of the Märjalen See, and of some beach terraces formed by its waters. He regards it as illustrative of the celebrated parallel roads of Glenroy, but, though this explanation has found very general favour with geologists, I must confess myself unable to accept it. But into this thistle-bed of controversy I must not permit myself to wander.

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#### THE BACILLUS OF MALARIA.

A PAPER of unusual interest in relation to the question of the agency of microphytes in the production of disease will shortly appear in Prof. Cohn's botanical *Beiträge* (vol. v. part 2). For many years the efforts of pathologists have been directed in this relation to the subject of malaria. The local conditions which determine the "endemic" prevalence of ague have been studied with considerable exactitude. They are such as to indicate very clearly that the material cause of intermittent fever, although it is generated in the soil, acts through the air. The fact that its influence is restricted within very narrow limits of distance from its source indicates that it is not diffusible like a gas or vapour, but consists of particles which, on various grounds, are surmised to be living organisms of extreme minuteness. Can this be established on evidence which will bear criticism?

All will remember that in 1879 Tommasi Crudeli published (in conjunction with Prof. Klebs) observations which tended to show that in malarious districts a *Bacillus* inhabits the soil which can be cultivated so as to yield a product capable, when inoculated, of producing in animals a fever of intermittent type, accompanied by the anatomical characteristics of malarious infection. Subsequently it was found by several observers that, during the cold stage of ague, spore-containing *Bacilli*, conjectured to be identical with those of Crudeli, are to be found in the blood.

These results have been received by pathologists with much misgiving, partly because the experimental proofs appeared inadequate, partly because other observers failed in their endeavours to verify them. Dr. Schiavuzzi, a medical practitioner at Pola, on the Adriatic, appears to have been more fortunate. Following the methods of Dr. Koch, he has sought for organisms in the air of the malarious district near the town in which he resides, and with such success that he is able, in repeated observations, to obtain without fail pure cultivations of a *Bacillus* which is not only indistinguishable as regards its structure from that of Crudeli, but also produces in animals the characteristic symptoms and pathological changes which belong to ague. The first communication of Dr. Schiavuzzi's results was made to the Accademia dei Lincei more than a year ago (see *Rendiconti*, vol. ii. 1886, April 4), but excited very little attention. It so happened that in the course of the past summer Prof. Cohn visited Pola, and so became acquainted with Dr. Schiavuzzi, who, during the present year, has been pursuing his investigations. In consequence, Prof. Cohn has been able to repeat the Pola experiments in his own laboratory at Breslau, and, so far as possible, to confirm the discovery. The writer had the opportunity, a short while ago, when Prof. Cohn was in England, of reading the proofs of Schiavuzzi's paper, and of seeing the very perfect photographs of the *Bacillus* which have been made of it at Breslau.

<sup>1</sup> Ramsay found the temperature of the water near the ice-cliff to be 3° C.

<sup>2</sup> J. T. quoted from the *Times in Alpine Journal*, vol. vi. p. 100.

<sup>3</sup> An account of this is given by F. V. Salis (*Jahrb. Schweiz. Alpencl.* 1878-79, p. 549). The discharge on this occasion was at first slow. It began at 8 a.m. July 18; by 4 p.m. the lake had sunk 1 metre; during the darkness it sank 4 metres, and by 3 p.m. most of the contents were gone. It was estimated that only 700,000 cubic metres of water out of 10,000,000 remained.